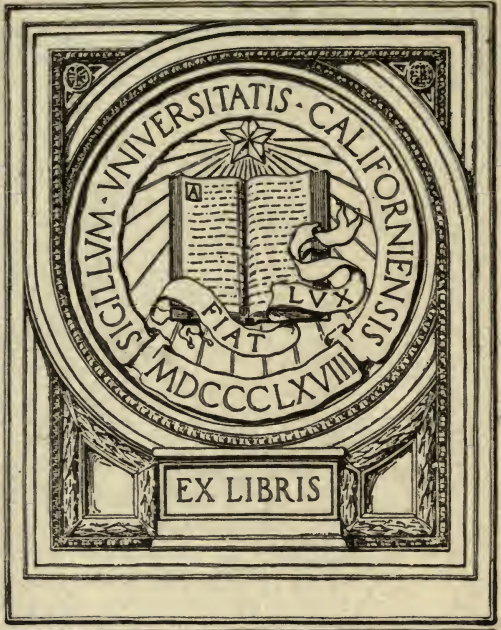
UC-NRLF
$B 257 633


SIGILLVM · VNIVERSITATIS · CALIFORNIENSIS
LVX
FIAT
MDCCCLXVIII
EX LIBRIS

891
W573

Educational Psychology Monographs

Relative Efficiency of Phonetic Alphabets

An Experimental Investigation of the Comparative Merits of the Webster Key Alphabet and the Proposed Key Alphabet Submitted to the National Education Association

BY

GUY MONTROSE WHIPPLE, Ph.D.

Educational Laboratory, Cornell University

Baltimore
WARWICK AND YORK, INC.
1911

RELATIVE EFFICIENCY OF PHONETIC ALPHABETS

Digitized by the Internet Archive
in 2007 with funding from
Microsoft Corporation

http://www.archive.org/details/relativeefficien00whiprich

Educational Psychology Monographs

Relative Efficiency of Phonetic Alphabets

An Experimental Investigation of the Comparative Merits of the Webster Key Alphabet and the Proposed Key Alphabet Submitted to the National Education Association

BY

GUY MONTROSE WHIPPLE, Ph.D.

Educational Laboratory, Cornell University

Baltimore
WARWICK AND YORK, INC.
1911

Copyright by
WARWICK AND YORK, INC.
1911

UNIV. OF
CALIFORNIA

PREFACE.

The action of the Department of Superintendence at Mobile, February, 1911, which brought the question of endorsing the Report of the Committee on a Universal Key-Alphabet before the general meeting of the National Education Association at San Francisco in July, came to my attention in March. I was struck with the fact that the evident issue between the Proposed Key and the key in common use was at bottom a pedagogical issue, and, moreover, one susceptible of experimental solution. In the three months available I therefore devoted to this problem what time could be spared from my university work, and obtained results so significant that they were reported orally at San Francisco by Dr. J. C. Bell of the Brooklyn Training School.

The record of this piece of experimentation is herewith set forth in monographic form without further elaboration or extension, partly because of lack of further time to devote to the problem, but more especially because the results secured, especially in the first two experiments, are so unequivocal and mutually corroborative as to make it exceedingly unlikely that the general conclusion reached would be affected by further investigation.

The study is published, then, as it stands, first, because it deals with a subject that has been much under discussion of late and that is plainly of importance, and secondly, because I believe that it offers a good example of the possibilities of applying the experimental method to educational problems.

GUY MONTROSE WHIPPLE.

Cornell University, October 17, 1911.

247068

CONTENTS

PAGE.

INTRODUCTORY 1

EXPERIMENT A 3
The Learning and Use of the Keys by School Children.

EXPERIMENT B 11
The Learning and Use of the Keys by College Students.

EXPERIMENT C 21
Tests of "Preferred Pronunciation" of Words Phonetically Spelled.

EXPERIMENT D 25
Use of the Proposed Key by Beginners in Reading.

APPENDICES 27

INTRODUCTORY.

The Committee of the Department of Superintendence of the National Education Association appointed to report upon a universal system of key notation has submitted a phonetic alphabet for the consideration of the members of the Association. As this "Proposed Key" differs markedly from the key now in common use—the Webster Key—and as the adoption of a new key means that practically every elementary text in spelling, reading, geography, and history in use in this country must be revised and that thousands of teachers will have to drop a familiar system and learn a new one, it is clear that the Committee's report is a matter of more than academic interest and is deserving of more than passing notice.

In the discussion that the work of the Committee has invoked thus far the quasi-commercial objections just cited have been raised, and it has also been pointed out that the Proposed Key is open to certain obvious criticisms from the standpoint of philology. However, it has seemed to us that if the new key is pedagogically superior to the older one, then it may very well be that its philological defects are of minor importance, that the textbook makers can be trusted to work out their own rearrangements, and that our teachers may reasonably be expected to acquire the new system.

The real issue is, then, is the Proposed Key pedagogically superior to the Webster Key? What merits and what defects has this Proposed Key in actual use by pupils and students in the classroom and the study? In answering these queries hitherto we have had but one minor bit of evidence at our command. The only system of primers ever published in this country that incorporated a system of key notation at all like that now proposed has been a complete failure and has been withdrawn from the market. Nevertheless, it will not do to reject

the Proposed Key on this evidence alone, since the failure of the primer in question may have been due to other defects than its phonetic system. Because of this paucity of factual evidence, and because we are convinced that it is well, before we take so important a step as the official endorsement of a radically new system of phonetic symbols, to have facts as well as opinions before us, we have essayed a series of experiments with the two keys.

These experiments were focussed upon the following questions: Is the Proposed Key more easily or less easily learned than a key like that now in common use, the Webster Key? When once learned, is it remembered as well as the Webster Key? Can it be used as a guide to pronunciation with as great facility and accuracy as the Webster Key?

Our results may be summarized thus: *Careful experiments with children in the public schools and with college students show that, without exception, the Proposed Key is more difficult to learn, and that, when once learned, it is more slowly and less accurately used, whether we measure the facility of its use by tests of pronunciation of the isolated symbols, pronunciation of proper names, pronunciation of nonsense syllables, or by tests of phonetic transcription of simple words. As a consequence, we have no hesitation in declaring that the key proposed by the Committee of the National Education Association is inferior for pedagogical purposes to the Webster Key now in common use.*

The experiments as a whole fall into four groups, A, B, C, and D. Experiment A is a test of learning and use of the two keys by public school children in Grades 7b and 8a, at Cortland, N. Y. Experiment B consists of more elaborate tests of learning and of use, conducted with a limited number of college students—one section at Cornell University, one section at the University of Missouri. Experiment C includes tests of the pronunciation of words written in either of the two keys, and may be termed a test of "preferred pronunciation." It is subdivided into two parts—C 1, tests with school children, and C 2, tests with college students. Experiment D, which was not fully completed, concerns trial of the Proposed Key with beginners in reading.

EXPERIMENT A.

The Learning and Use of the Keys by School Children.

The *object* of Experiment A was to determine which key is the more desirable, on psychological and pedagogical grounds, for use in the public schools.

The *general plan* was to deal with children who had mastered the mechanics of reading, but who had not been taught any foreign language, who had not been drilled in the pronunciation system of any dictionary, and who had not had systematic drill in phonics. It was necessary, furthermore, to secure two groups of adequate size, with equal distribution of general ability and zeal, who could be taught by the same teacher. After extensive correspondence, which revealed the great difficulty of meeting these conditions,—because in most school systems the Webster Key is taught more or less systematically from the first grade on,—we were fortunate in securing two groups in the public schools of Cortland, N. Y.*

Method.† The 46 pupils of Grade 8b worked with the Webster Key only, the 37 pupils of Grade 7a with the Proposed Key only. When those pupils who were absent during any day of the experiment are excluded, there remain 38 pupils who learned the Webster, 31 who learned the Proposed Key.

The experiments comprised five exercises in learning and six tests which were used to measure the speed and permanence of

---

*Grateful acknowledgment is made to Supt. F. E. Smith for his courtesy in permitting the administration of the experiment and to Mr. Francis Kane for his careful conduct of the learning lessons.

A few of these pupils knew the ordinary Webster marks for the long and short *a* and for the long and short *e*. Due allowance has been made for this circumstance in drawing our final conclusions.

†See Appendix I of this report for a detailed statement of the "Directions for Conducting Experiments with Phonetic Keys" as submitted to the conductor of this experiment.

the memorizing and the facility with which the keys could be used.

The *learning exercises* started on Monday and continued for five days. Each day printed keys (see Appendix J) were supplied, one to each pupil, for use during the exercise only.

The *first lesson* was prefaced by an explanation of the nature of a phonetic alphabet (as explained in Appendix I). Following this explanation, the key was worked over slowly, and attention was called directly to each letter-symbol, to its key-word or words, and to the sound of the symbol. For example, the teacher began work with Key 1 (the Webster Key) thus: "*A* as in *ale,* or as the vowel sound in *prey.* Look at the letter: notice that it is a small letter *a* with a straight line above it. It means the sound *a* [pronouncing the *a* in *ale*]. Take the next letter. This is another sound of *a, a* as in *care.* You notice this *a* has a different mark over it. It means the sound *a* [pronouncing the *a* in *care*]." The whole key was worked through in this manner.

In the *remaining four lessons* no attempt was made to call attention to the form of the symbol. The printed keys were distributed to the pupil, were turned over at command, and the pupils repeated them, line by line, in concert, following the teacher's reading. Here the ordinary name of the letter was not spoken, but only its phonetic sound. The teacher, and after him the class, said, for instance, "ah," as in *arm,* using the sound of *a* that is found in *arm,* not the name of the letter *a.* The same procedure was followed for all the sounds of the key, both consonants and vowels. The reading of the key straight through once in this way constituted one lesson.

The tests. The comparative merits of the two keys were measured by means of six tests.

Test 1 was administered directly after the third learning exercise and was designed to measure, by the number of errors committed, the exactness with which the associations between the phonetic symbols and their respective key-words had been formed. The method was to display, one at a time, in order, a series of enlarged symbols (so made as to be visible at a dis-

tance of 40 feet), and to request the pupils to write the key-words that had been learned to illustrate the several symbols. For example, when the phonetic symbol au (fourth character in Key 2) was displayed, the pupils would, if they had learned this association, write the key-word *out.* If another word than that printed in the key were given, this was not counted an error, provided it correctly illustrated the sound of the symbol. The results, shown in Appendix A in detail, and summarized

TABLE 1.

(Summary of Appendix A.)

Comparative Accuracy of Association of Symbols and Key-Words, as Shown by Average Number of Errors Made per Pupil in Cortland Grammar School.

	Number Pupils.	Test 1.	Test 2.	Test 3.	Test 4.
Webster Key	38	10.16	5.37	6.08	6.92
Proposed Key	31	14.97	9.50	9.03	10.77

in Table 1, indicate plainly that, *after three learning lessons, the Webster Key is farther advanced toward mastery than is the Proposed Key. More exactly, the average pupil makes 10.16 errors with the Webster, as compared with 14.97 errors with the Proposed Key, or, in other words, 47.3 per cent more errors are made with the Proposed Key.**

Test 2 was precisely like Test 1, save that it was administered directly after the fifth learning exercise.

The results are shown in Appendix A and summarized in Table 1. They indicate plainly that the learning has now pro-

*It should be kept in mind that the Webster Key contained 46 symbols, the Proposed Key only 44 symbols. The symbols added in the former are the *e* in *maker* and the *ng* in *sing.* In the Proposed Key, apparently the only symbol that can be used for the first of these sounds is "ŋ," and the only symbol that can be used for the second is "ŋ." Since, as psychological experiments have shown, a slight addition to the length of a fairly long series of associations makes a measurable increase in the difficulty of memorizing the series, this circumstance may counterbalance the slight advantage for the Webster Key of the familiarity of a few pupils with four of its symbols. It should also be borne in mind that in this experiment only those Webster symbols are used that correspond in power to the symbols of the Proposed Key. There are other symbols in the Webster Key used to indicate finer distinctions in sound, for which the Committee has proposed no corresponding symbols. These other symbols were necessarily disregarded to insure comparable conditions.

gressed farther with each key, but that, by the fourth and fifth lessons, the number of errors with the Webster Key has been reduced about one-half, whereas those with the Proposed Key have been reduced only two-fifths. *At the end of the fifth lesson, the average pupil makes 5.37 errors with the Webster as compared with 9.20 errors with the Proposed Key, or in other words, 71.3 per cent more errors are made with the Proposed Key.*

Test 3 was administered on the day following the fifth lesson,* and was designed to measure, by the number of errors committed, the exactness with which the associations between the key-words and their phonetic symbols had been formed. It differs from Tests 1 and 2, then, in calling for the reverse association, *i. e.*, the association from key-word to symbol instead of from symbol to key-word. For example, with Key 1, the instructions were: "Write the symbol (or phonetic letter) for the *a* in *ale*." "Write the symbol for the *a* in care," and so on, straight through the key.

The results are shown in Appendix A and in Table 1. Here, again, the superiority of the Webster Key is evident. *After five days of learning, 48.5 per cent more errors are made with the Proposed Key than with the Webster Key in associating symbols to key-words.*

Now, it should be noted that, in the Proposed Key, special emphasis has been laid upon the avoidance of diacritical marks. These marks have been eliminated, however, only by resorting to the device of using different letter-forms, with or without the macron. Thus we find two forms of A, "a" and "ɑ"; two forms of O, "o" and "ɵ," and two forms of U, "u" and "ʊ"—each form with and without the macron. The question arises whether the discrimination of these different forms of the same letter is not a greater source of confusion, both as a simple matter of eyesight and as a matter of mental differentiation, than is the discrimination of the diacritical symbols of the Webster Key.

*On account of Arbor Day exercises at the Cortland school on Friday of the week of learning, the fifth learning exercise came, with each group, on the following Monday. Test 3 was given on Tuesday, then, instead of on Monday, as indicated in Appendix I.

Reference to the data for Tests 3 and 4 in Appendix A shows plainly that this query must be answered in the affirmative. Thus, in Test 3, more than half of the errors committed with the Proposed Key are errors pertaining to the several forms of *a*, *o*, and *u*. *We conclude, therefore, that the replacement in the Proposed Key of diacritical marks by diverse letter-forms is a distinct pedagogical disadvantage.*

Test 4 was administered one week after Test 3, and was designed to measure, by the number of errors committed, the relative permanence of the associations in the two keys after a lapse of one week during which there was no more learning and during which the keys were not used or referred to. It differed from Test 3 in one respect: in order to eliminate the possible effect of serial association, the key-words were presented in chance order instead of in the order of the original keys.

The results are shown in Appendix A and in Table 1. It will be seen that the chance order and the lapse of the week without further learning have slightly increased the number of errors in the Webster Key (on the average by 0.84 error), but has increased the number of errors in the Proposed Key somewhat more (on the average by 1.74 error). *One week after learning has ceased, 55.6 per cent more errors are made with the Proposed Key than with the Webster Key in associating symbols to key-words.*

Inspection of Appendix A shows that, here again, as in the case of Test 3, more than half of the errors committed with the Proposed Key are errors pertaining to the several forms of *a*, *o*, and *u*.

Test 5 was administered one day after Test 4, and was designed to measure the facility and accuracy with which the two keys could be used by the pupils in actual phonetic transcription. The test-material consisted of a printed slip (see List M, Appendix M), containing 50 simple words, with instructions: "Write in Key 1 (or 2) the phonetic equivalent of the following words. Work as rapidly as you can, but try to make no mistakes." Twenty minutes were allowed.

The results showed what, perhaps, might have been anticipated, that the task was too difficult for grammar-school children. (It was, in fact, difficult for the college students, as our results will show.) The pupils confined themselves almost entirely to the marking of the vowel qualities, without attempting any exact phonetic transcription. For this reason, it is probably fairer not to attempt statistical presentation. It may be stated, however, that pupils who had worked with the Webster Key marked correctly a fairly large number of the vowels, whereas pupils who had worked with the Proposed Key practically did not mark correctly a single vowel. We may leave this test with that statement and turn to the more exact, quantitative results afforded by the next test.

Test 6 was administered three days after Test 3. It had not been contemplated in the original plans for the school experiments (Appendix I), because it necessitated individual sittings under the writer's own control. It consisted in actual tests of

TABLE 2.

Comparative Accuracy in Sounding Essential Symbols Shown by Two Groups of 18 Children Each in Cortland Grammer School.

Webster Key.				Proposed Key.			
Symbols	Cases.	Errors.	Per cent Wrong.	Symbols.	Cases.	Errors.	Per cent Wrong.
24	432	110	25.5	23	414	224	54.1

pronunciation of the characters peculiar to the two keys, and was administered by the writer to 18 members of Group I and 18 members of Group II, at Cortland. These 36 children, all that could be tested in the three hours available, were selected by their teacher, Mr. Kane, in such a way as to form two representative groups, with no perceptible difference in their collective ability. The Proposed Key was represented by 23 symbols peculiar to it, the Webster Key by its symbols for the same

sounds, plus a 24th symbol, the *e* of *maker*. (The Webster Key was, therefore, at a slight disadvantage since one more chance for error was introduced into its series.) The symbols were arranged in chance order, to avoid serial association. They were displayed, one at a time, in enlarged form, and the pupil was asked to sound them. All erroneous pronunciations were recorded, but the pupils were not corrected (lest this might interfere with the other tests).

The results of this test—which are more significant than those of Tests 1 to 5 because the test demands the same visual-auditory association that characterizes the use of any phonetic key in dictionary use—are recorded in detail in Appendix B and summarized in Table 2. It will be noted that *when, after the same length of time spent on learning the two keys, grammar-school children in the seventh and eighth grades attempt to give the correct sound for the special symbols peculiar to each key, the percentage of error for the Proposed Key is more than twice as great as the percentage of error for the Webster Key.*

It may be objected that we have not allowed for the fact that a few pupils knew the long and short values for the vowels *a* and *e* in Key 1. This objection is partly met by the inclusion of one more character in our test. To obviate it entirely, we may exclude all reference to these four vowels. By consulting Appendix B, it will be found that 19 errors were made with these four characters. When these are subtracted, we have left 20 characters and 18 pupils, a total of 360 cases, with a total of 91 errors, or 25.3 per cent wrong. Hence, the elimination of the four Webster symbols known to a few pupils actually *reduces* the per cent of wrong pronunciations in this key from 25.5 per cent to 25.3 per cent. Accordingly, *the fact that our results in Test 6 indicate a decided superiority of the Webster Key can not be attributed to the slight knowledge of this key possessed by a few pupils.*

An examination of the errors committed with the Proposed Key (Appendix B) shows that, *for grammar-school children, the difficulty of the Proposed Key lies in part, as it does for col-*

lege students, in the use of the three groups of four symbols each that are used for the sounds of "a," "o," and "u," and which are specially liable to confusion, but in part, also, to the shift from English to Continental vowel values. With college students, as will be shown later, this latter feature is not a special source of difficulty.

EXPERIMENT B.

The Learning and Use of the Keys by College Students.

The plan of Experiment B was to carry out a series of learnings and tests of applicability in a general way like those of Experiment A, but with these differences: (*a*) the observers were college students, all of them familiar with the vowel qualities of the Continental tongues; (*b*) the work was done individually, instead of by groups; (*c*) each observer learned and used both keys; (*d*) the learning was continued until an errorless association was made for all symbols; and (*e*) the tests of the use of the keys were more elaborate and precise.

These arrangements permitted the cancellation of experimental errors, particularly of chance individual differences, and of such constant errors as the effect of practice and of possible interference of association between the one key and the other. They also permitted us to compare the applicability of the two keys when they had been previously brought to the same stage of mastery.

Two sets of students acted as *observers*. The first set, twelve undergraduates at Cornell University, worked under the direct supervision of the writer, who was assisted in the conduct of the tests by Miss Emily T. Burr, graduate student in psychology and education. The second set of students, six in number, undergraduates at the University of Missouri, were tested by Mr. M. G. Neale, under the supervision of Dr. W. H. Pyle, Assistant Professor of Educational Psychology.

In both sets the *general method* of conducting the experiment was the same. The students were divided into two squads: the first squad learned the Webster Key first, then the Proposed Key; the second squad learned the Proposed Key first, then the Webster Key.

Method of Learning the Keys.

In the *preliminary session,* members of both squads first learned the 20 symbols that were common to both keys. These symbols were exhibited in enlarged form, one at a time, and sounded, first by the experimenter, then by the student. The series was repeated until the student could, unaided, sound correctly all these symbols. This preliminary work cleared the way for the learning of the special symbols peculiar to the two keys.

In the *first regular session,* the experimenter, in the first reading, taught the students the 24 symbols of Key 1 (or Key 2), by showing the enlarged symbols, in order, one at a time, giving the sample key-words (written for this purpose on the back of the cards, and hence visible to the experimenter, but not to the student), explaining the sound, and directing the student to pronounce it.

The experimenter, in the second reading, then repeated the series as before, save that the key-word was not given. The symbol was shown, pronounced by the experimenter, and then repeated by the student.

In the third repetition of the key, the experimenter merely showed the symbols, while the student pronounced them. In case of error, the experimenter promptly corrected it, and at the same time gave the student the key-word once more. These errors were carefully noted, so as to furnish a record of the number of errors and of the symbols that occasioned them.

If any errors were made in this third repetition of the key, the experiment was continued, in the same manner, so that the first session closed only when the student could sound correctly, upon presentation in regular order, the 24 symbols in the key. The speed of learning was thus measured by the number of repetitions needed to learn the key and by the number of errors committed in the process. The total number of repetitions includes the two first readings, in which the student followed the pronunciation of the experimenter.

The *results* are shown in Appendix C. It will be seen that, to bring the keys to the point of a single errorless repetition required, for the twelve Cornell students, 91 repetitions with

the Webster Key and 104 repetitions with the Proposed Key: with the six Missouri students, 39 repetitions with the Webster Key and 47 repetitions with the Proposed Key. In these repetitions, the Cornell students made 131 errors with the Webster Key, and 204 errors with the Proposed Key; the Missouri students made 79 errors with the Webster Key, and 107 errors with the Proposed Key. Or, taking the two sets of students together, we find that, *to insure the first errorless repetition, the Webster Key takes 130 repetitions (with 210 errors); the Proposed Key takes 151 repetitions (with 311 errors).*

In the *second session,* which took place for each student 24 hours after the first session, the experimenter repeated the same exercise prescribed for the third repetition in the first session. The idea was, of course, to see what part of the learning of the previous day had been lost during the 24 hours. The experimenter continued this form of exercise until the student once more sounded the 24 symbols correctly when they were displayed, one at a time, in regular order. This result was reached in from one to four repetitions (see Appendix C).

The experimenter next shuffled the symbol-cards to bring them in chance order. The idea was to destroy the original serial order of presentation in order to see whether the student could sound the symbols correctly without the help of the previous serial associations. If errors were made, the cards were again shuffled, and this test with the chance order was continued until the student accomplished an errorless sounding of the entire 24 symbols. The symbols were then regarded as learned and the experimenter at once proceeded with the series of tests to be described below.

The *third and the fourth sessions,* which followed one week later, were like the first and the second sessions, save for the change of the key.

The *results* of the learning in the second session may be summarized from Appendix C as follows: *To restore the keys after a lapse of 24 hours to the point of a single, errorless repetition (in regular order) required, for the 18 college students, with the Webster Key 27 repetitions (with 11 errors), with the Proposed Key 35 repetitions (with 31 errors). When the symbols*

were shuffled into chance order, to master the Webster Key required the addition of 38 repetitions (with 58 errors), while to master the Proposed Key required the addition of 89 repetitions (with 175 errors).

A general summary of all the work expended in learning the two keys, *i. e.*, of the repetitions and of the errors of the first session and of both regular and chance orders of the second session with each key, has been made in Table 3. No one can examine these results and avoid the conclusion: *The learning of the Proposed Key is much more difficult than the learning of the Webster Key. Speaking exactly, we find that the learning of the Proposed Key by college students exacts 41% more repetitions, with 85% more errors, than the learning of the Webster Key.*

TABLE 3.

Summary of Appendix C, Showing Comparative Ease of Learning the Two Keys.

		Webster Key.		Proposed Key.	
Institution.	Number.	Repetitions.	Errors.	Repetitions.	Errors.
Cornell	12	133	187	192	365
Missouri	6	62	92	83	153
Both	18	195	279	275	518

An examination of the distribution of the errors committed in learning the Proposed Key is instructive. The records of the six Missouri students and of four Cornell students *(Wa., Je., Do., and Ne.)*, chosen by chance, afford satisfactory data to make this examination. We discover that, in the case of col-

TABLE 4.

Distribution of Errors in Learning the Proposed Key. Ten College Students.

Symbol	ā	ɑ	ɑi	ɑu	ä	a	ch	ē	e	ī	i	iu
Errors	10	16	3	6	27	10	3	3	0	1	3	8
Symbol	o	ė	ɵ	ɵi	sh	th	th	ū	u	ū	U	ʒ
Errors	9	28	22	0	1	4	3	26	20	31	17	1

lege students at least, it is not the use of the foreign vowel values, *e. g.*, symbols "e" and "i," that makes the learning of this key difficult, but rather the use of the two different forms of the letters *a, o* and *u. This result confirms in a positive manner the conclusion reached in Experiment A (under Test 3), viz: the replacement, in the Proposed Key, of diacritical marks by diverse letter-forms is a distinct pedagogical disadvantage.*

It may be objected that this decidedly greater ease of learning of the Webster Key is due to familiarity with its phonetic system. To throw light on this matter, we subjoin statements of the extent and nature of the previous drill in pronunciation possessed by each of our student observers—first of the Cornell, second of the Missouri observers.

May. has no knowledge at all of phonetic systems, but has had drill in pronouncing French and German.

Di. has no knowledge at all of the Webster system, but has had two years of Latin (Roman pronunciation) and five years of German.

Do. has picked up a limited knowledge of the Webster system from the use of the dictionary, but his associations of the vowels and their sounds is crossed by other associations with the same vowels from the Roman pronunciation of Latin and from work in German.

Je. has had no drill in phonetic systems, and had merely the idea that a "long vowel" means the sound of its name. He has had drill in the Roman pronunciation of Latin and in German.

Yo. knows the difference between "long" and "short" vowels, but has had recent drill in Latin (Roman system) ; also in German and French.

Da. has no knowledge at all of the Webster system, but has read Latin (Roman system), German, and French.

Ne. knows only the sound of the "long" vowels, and has had recent work in Latin, Greek, German, and French.

Wa. has some knowledge of phonetic systems, but has also read Latin with Roman pronunciation, and has studied German, Greek, and Hebrew.

Mat. has a slight knowledge of phonics overlaid by four years of Latin (Roman system), four years of German, and some French.

Bo. is a native German, knows no Webster symbols, has studied Latin with Roman pronunciation, and had one year of French.

Sa. knew the Webster symbols for the "long" and "short" vowels, but has also been drilled on the Roman pronunciation of Latin, and has taken work in German and French.

Bl. has a slight acquaintance with phonetic systems, has studied Old English, Latin (Roman system), German, and French.

Mo. had a little drill in the Webster system in the primary grades, but has since then studied Latin for five years with Roman pronunciation, has had a great deal of German, and some French.

Wa. had the same experience as Mo., save that work in foreign tongues comprised three years of Latin, two of German, and two of French.

Mc. had the same experience as Mo.

Bas. had some study of phonetic marks in the primary grades, followed by five years of Latin and one of French.

Bar. speaks German as her native tongue, has no knowledge of the Webster system at all; has had six years of Latin and some French.

Mu. has no knowledge of the Webster system at all, but three years of Latin, and one each of German and French.

When these statements are considered, we shall not be able to find that the situation favored the quick assimilation of the Webster Key. Six of the students have no knowledge of that key at all. No one of them was entirely conversant with it. Those who have a slight familiarity with it gained this so-called familiarity, for the most part, in the primary school and recall now only the meaning of the "long," or perhaps of the "long" and the "short" vowels. On the other hand, every one of the students has had a large amount of drill in the pronunciation of European tongues, especially of the Roman pronunciation of Latin, and this drill, it is important to note, has been recent as well as extensive. Since one feature of the Proposed Key is the use of the Continental vowel values, the situation favors the learning of the Proposed Key, if it favors either key at all.

Method of Testing the Use of the Keys.

Whatever may have been the previous drill of the several students, they were, all of them, brought during the second (or fourth) session to the point where they could just repeat without error the special symbols of the key they had been studying, when shown in chance order. They were then equally prepared, so far as knowledge of the keys is concerned, to undertake their use in pronunciation.*

The facility of use in pronunciation was measured by three tests. Test 1 was a test of speed and accuracy of pronouncing difficult proper names when these names were printed in phonetic characters of the key just learned. Test 2 was a similar test of the pronunciation of short nonsense syllables. Test 3 was a test of phonetic transcription like Test 5 of Experiment

*It should, perhaps, be explained again that the third and fourth sessions for each student were like the first and second, save for the change of key. In comparing the results of the several tests of learning and of use, each key is, therefore, the first key learned in half the cases, the second key learned in the other half. What effect the shift of key had on each squad may be gleaned from an examination of the results in the several appendixes. This special problem has not been worked out in this report, because it has no direct bearing upon the results. Generally speaking, two opposed factors are at work, first the favorable effect of practice, second the unfavorable effect of associative interference.

A. The precise methods and the results of these tests must now be described.

Test 1. The object has been stated. The test-material comprised Lists A, B, C, and D, each of which contains 25 rather difficult proper names (see Appendix K). Lists A and B were given to each student in his second session, *i. e.,* just after he had learned his first key: Lists C and D were given to each student in his fourth session, *i. e.,* just after he had learned his second key. Since the squads reversed the order of using these lists, all constant errors are eliminated, and, by summing up the results for the four lists, the net efficiency of the two keys is directly shown.

In administering this test, the printed sheet was folded so as to show only the column containing the phonetic pronunciation that the student had just learned. The column was then covered with a strip of stiff paper in which was cut a slit just large enough to expose one word at a time. The experimenter, after a warning "ready" signal, uncovered one word at a time, and directed the student to pronounce the word as quickly as possible, but only when he was sure of the pronunciation and could pronounce it as a whole. The time elapsing between exposure and pronunciation was recorded for each word (in fifths of a second), and every error of pronunciation (errors of accent excepted) was checked off by the experimenter upon a tally list.

TABLE 5.

Summary of Appendix D, Showing Use of the Two Keys in Pronouncing Proper Names.

		Webster Key.		Proposed Key.	
Institution.	Number.	Time.	Errors.	Time.	Errors.
Cornell	10	1894.4	222	1850.1	226
Missouri	6	1511.8	135	1801.2	148
Both	16	3406.2	357	3651.3	374

The results are given in detail in Appendix D, and summarized in Table 5. *We find that, although the moment before*

the test was applied both keys were equally well learned, there appears, nevertheless, a slight difference, both of speed and of accuracy, in favor of the use of the Webster Key, when used to determine the pronunciation of proper names.

Since, to anticipate somewhat our order of presentation, it turns out that, in Tests 2 and 3, the Webster Key is found to be very distinctly better than the Proposed Key, we are, perhaps, called upon to explain why the difference does not appear more markedly in Test 1 as well. We think the explanation is not far to seek. Most of the proper names in Lists A-D are from the Continental languages. Wherever, therefore, their pronunciation was suggested at all by the general aspect of the word shown, it coincided more nearly with the Proposed Key than with the Webster Key. The fact that, despite this tendency, the Webster Key is superior is to be noted.

Test 2, which followed directly after Test 1, was administered by the same method of seriatim exposure, and differed from it merely in the nature of the material, which consists of four 25-word columns of nonsense syllables, Lists I, J. K, and L (see Appendix L). Lists I and J were given to each student directly after Lists A and B: Lists K and L were given directly after Lists C and D.

The results are given in detail in Appendix E and summarized in Table 6. The pronunciation by 16 college students of 100 nonsense words each, when these words were printed in the phonetic systems of the two keys, took with the Webster Key a total of 1163.6 seconds, with the Proposed Key a total of 1342.6 seconds. With the Webster Key 127 errors were made;

TABLE 6.

Summary of Appendix E, Showing Use of Keys in Pronouncing Nonsense Syllables.

		Webster Key.		Proposed Key.	
Institution.	Number.	Time.	Errors.	Time.	Errors.
Cornell	10	664.1	82	718.4	125
Missouri	6	499.5	45	624.2	56
Both	16	1163.6	127	1342.6	181

with the Proposed Key 1 errors were made. *In other words, when the two keys have just previously been brought to the same stage of memorization, a test of application by the pronunciation of nonsense syllables written in the two keys shows that the Proposed Key takes 15.4% longer, and is accompanied by 42.5% more errors, than is the Webster Key.*

Test 3, which followed directly after Test 2, was identical with Test 5 of Experiment A, save that the time taken to make the transcription was recorded.* The material was Lists M and N (see Appendix M). List M was given to each student at the close of his second session, List N to each student at the close of his fourth session. Ultimately, then, each student completed both lists, and wrote out the phonetic transcription of 50 words in each key. A combination of the results for both lists permits, as before, a direct comparison, free from constant errors, of the merits of the two keys.

The results are detailed in Appendix F, and summarized in Table 7. In the detailed results, distinction has been made between errors that involved one of the 24 special symbols peculiar to each key and errors that involved one of the 20 symbols common to both keys; these are differentiated as key errors and common errors, respectively. In Table 7, the common errors have been disregarded. The existence of a considerable number of them gives further evidence of the difficulty of this test as compared with the others that were employed.

TABLE 7.

Summary of Appendix F, Showing Use of the Keys in Phonetic Transcription.

		Webster Key.		Proposed Key.	
Institution.	Number.	Time.	Key Errors.	Time.	Key Errors.
Cornell	10	4589	164	5130	222
Missouri	6	----	99	----	134
Both	16	----	263	----	356

*Through an ambiguity in the instructions, the errors only were recorded for the University of Missouri students.

The results of Experiment B, Test 3, show that, when college students who have memorized both keys to the same degree of mastery use the keys in phonetic transcription of simple words, the Webster Key is distinctly superior. Speaking quantitatively, the application of the Proposed Key takes 12% longer and involves 35% more errors than the application of the Webster Key.

EXPERIMENT C.

Tests of "Preferred Pronunciation" of Words Phonetically Spelled.

C 1. Tests with School Children.

The *object* of this experiment was to ascertain to what extent and how accurately school children who had had a certain amount of phonic drill would interpret in the Webster Key monosyllabic words printed in phonetic form and containing a symbol that might be given an interpretation in the Webster Key or in the Proposed Key. For example, the phonetic word "stīl" would be interpreted as *style* in the Webster Key, but as *steal* or *steel* in the Proposed Key.

A second object was to see what pronunciation would, in the absence of instructions, be given naturally to certain symbols of the Proposed Key that are not common to the Webster Key.

Method. A series of 36 words was prepared (see Appendix G and Appendix H), printed in large type on slips of cardboard, arranged in chance order, and presented by the writer, one at a time, to a class of children in the 4th grade of the East Hill School, Ithaca.

The preliminary instructions were substantially these: "I shall show you a number of cards, 36 in all. On each card are letters to show the pronunciation of a certain word. You must understand that the word is not spelled out the way it would be in ordinary printing: the letters you see are just marks to show the *sounds* of some word. I want you to write out on your papers what word you think each of these cards is meant to represent. For example, if you were shown "ûrth," you would write *earth;* if "lăch," you would write *latch.*"

Results. The data secured are displayed in Appendixes G and H, and in Tables 8 and 9. Inspection of Table 8 will justify

the following conclusion: Words containing phonetic symbols found in both the Webster and the Proposed Key are pronounced in accordance with the Webster Key in an overwhelming majority of cases, when displayed to grammar-school pupils. To be more specific: "ā" is pronounced according to Webster 132 times, according to the Proposed Key, 9 times; "ī" is pronounced according to the Webster Key 128 times, according to the Proposed Key, 4 times; "ē" is pronounced according to the Webster Key 121 times, according to the Proposed Key, once; "ū" is pronounced according to the Webster Key 48 times, according to the Proposed Key, 30 times.*

TABLE 8.

Summary of Appendix G, Averages for Preferred Alternative Pronunciation.

Symbol.	38 School Children.				34 College Students.			
	Webster	Proposed	Other.	Blank.	Webster	Proposed	Other.	Blank.
ā	22.00	1.50	8.17	6.33	30.66	1.83	1.17	0.33
ī	21.33	0.66	12.66	3.33	25.83	7.00	1.00	0.17
ē	30.25	0.25	5.75	1.75	27.50	4.25	1.75	0.50
ū	16.00	10.00	4.00	8.00	14.66	18.00	1.33	0.00

The tests with school children for the three symbols peculiar to the Proposed Key (ɑi, ɑu, and u) result as follows (Appendix H and Table 9): the chances are 225 in 234 that "ɑi" is not pronounced according to the Proposed Key: in 200 cases it is interpreted as *a* in *ale*. The chances are 72 in 98 that the symbol "ɑu" is not pronounced according to the Proposed Key. (The chances are, however, one out of two that the corresponding Webster symbol, "ou," is correctly pronounced). The Proposed Symbol "u" (sound of *u* in *pull*) is taken correctly in only 7 of 92 cases: here the tendency is strong to give the sound of the *u* in *up* (66 cases).

*The seemingly greater frequency of the pronunciation by the Proposed Key with this symbol is due to the third test-word, "fūd," because the children did not know the word *feud*. When this test-word is omitted, the symbol is pronounced according to the Webster Key 45 times, according to the Proposed Key 8 times.

In short, the symbols that were tried that were peculiar to the Proposed Key (and that had no chance of interpretation according to the Webster Key) were, in a large majority of instances, not pronounced in accordance with the intent of the makers of the Proposed Key. This shows, again, that, to grammar-school children at least, the intended interpretation of these symbols is not a natural one.

C 2. Tests with College Students.

The plan here was to repeat the tests of preferred pronunciation as given to school children, but with a group of college students who had had little or no formal instruction in the Webster Key, but who had had, on the other hand, definite formal instruction in the pronunciation of one or more foreign languages with the Continental vowel values.

TABLE 9.

Summary of Appendix H, Averages for Three Proposed and One Webster Symbol.

Symbol.	38 School Children.			34 College Students.		
	Like Key.	Unlike Key.	Blank.	Like Key.	Unlike Key.	Blank.
ɑi	1.12	30.37	6.50	5.12	28.40	0.50
u	2.33	30.00	5.66	28.66	5.33	0.00
ɑu	9.33	24.00	4.66	20.33	13.33	0.33
ou	16.33	17.00	4.66	20.66	12.66	0.66

In a class of 34 Cornell University students, mainly sophomores, these conditions were sufficiently well realized. Of these 34 students, 11 had had some phonic drill in the primary school, 2 in the grammar school, and 1 in the high school, while 19 had had no such instruction in any school classes. Inquiry as to their familiarity with the pronunciation keys of dictionaries showed that 10 had no knowledge whatsoever of these keys, 5 knew "only a little," 8 had "some familiarity," while only 8 felt fully prepared to use these keys.

On the other hand, every one of these students had studied Latin (31 of the 34 with Roman pronunciation), while 32 had studied German, 26 French, 9 Greek, 5 Spanish, 2 Italian, 2 Anglo-Saxon, and one each Hebrew and Danish. It will be seen, then, that this group of students was disposed, by recent and systematic drill, to give Continental values

to the vowels, whereas their instruction in the ordinary English phonetic-key values was either lacking, desultory, or practically forgotten (after the test only 8 students reported that they had been guided by the idea that the macron indicated a long vowel sound).

The *results* are shown together with those obtained with school children for the same tests. From Table 9 we gather that *college students who have little or no familiarity with the Webster Key, and who have had systematic drill in the pronunciation of Latin and of other foreign languages show, nevertheless, a decided tendency to interpret phonetic symbols in terms of the Webster Key, rather than of the Proposed Key, under conditions that permit either interpretation.* Thus the chances that "ā" is pronounced as *a* in *ale* are about 31 in 34; the chances that "ī" is pronounced as *i* in *ice* are about 26 in 34; the chances that "ē" is pronounced as *e* in *eve* are about 28 in 34; the chances that "ū" is pronounced as *u* in *use* are about 15 in 34, as "o͞o" about 18 in 34.*

With the college students, the test for natural and uninstructed interpretation of three symbols of the Proposed Key show that the symbol "ɑi" is not interpreted according to that key (but oftenest as *a* in *ale*). The symbols "u" and "ɑu," however, tend to fall into the scheme of the key. The Webster "ou" is on approximately the same footing as the Proposed "ɑu" for the vowel-sound in *out.*

The results of Experiment C are merely confirmatory in nature and indicate that the Webster Key gives a series of associations for several of the more important symbols that are more naturally selected (both by school children and by college students) than are the associations on which the Proposed Key is based.

*As in the case of the school children, though to a lesser extent, college students failed to associate the word *feud* to the symbol "fūd." That is, the commonness of *food* as compared with *feud* favored an association coincident with the Proposed Key. When this test-word is omitted, the tendency toward the Webster Key is again revealed.

EXPERIMENT D.

Use of the Proposed Key by Beginners in Reading.

Experiment D could not be carried out with sufficient exactness and thoroughness in the time at our disposal to warrant the drawing of scientifically valid conclusions from it. It ought, we judge, to have one or two years devoted to it. For the sake of completeness of this report, however, we shall state briefly what attempts were made in this direction.

The general idea was to start two groups of beginners in reading under the same teacher,—the one group to make use of the Webster Key, the other of the Proposed Key, in so far as phonetic symbols came naturally to be used at all.

The experiment was started in the primary room of the East Hill School, at Ithaca, but was interrupted by a number of obstacles. It was impossible, in the first place, to secure two groups of beginners, in the strict sense of the word, at this time of the year (March). The group selected for the use of the Proposed Key had had several weeks of elementary work in reading. In order, then, to secure equivalent conditions, it was felt that the group using the Proposed Key ought to have a primer, since the Webster group were using a regular primer. We then attempted to use the Funk & Wagnalls Standard First Reader, since this text follows fairly closely the general phonetic system of the Proposed Key. After a week's trial, so many objections arose to this Reader, both from teachers, parents, and pupils, that the experiment was given up at this school and transferred to the kindergarten room at the Central School, Ithaca. The available pupils in this room had, fortunately, no training at all in reading, but they were so few in number, 12 in all, as to make it inexpedient to try the two-group method. For this reason, the Proposed Key was used with all the pupils. The Funk & Wagnalls Reader was given

up as pedagogically unfit, and the experiment was conducted by the teacher, Miss Jessie Bartholomew, by means of board and card work, in which all the phonetic symbols followed the Proposed Key.

Since only two months were available for this test, and since there was no check experiment with the Webster Key, we can do no more than to record the verdict of the teacher, based upon her comparison with her previous work with the Webster Key. Miss Bartholomew reports that she would have no hesitation in choosing the Webster Key, were she given her choice of keys for use in beginning reading. This judgment, based on five weeks work with 13 symbols, is perhaps as definite a statement as the conditions warrant. It coincides with the outcome of our experimental work with older children and with college students.

In conclusion, we can but re-assert our conviction that the system of key-notation proposed by the Committee of the National Education Association is pedagogically undesirable because it is unnatural, difficult to learn and to use. In all these respects, it is, for schoolroom use, inferior to the key now generally and widely employed. These facts are conclusive argument against the indorsement of the key by the teachers of the country.

So far as we are aware, our experiments constitute the only attempt that has been made to submit the Proposed Key to the "acid test" of experience. It does not pass this test.

APPENDIX A.

Errors in Tests 1-4, Cortland Pupils, Webster Key.

Pupils.	Test 1.	Test 2.	Test 3.	Test 4.
Ackley	7	0	1	0
Andrus	11	1	0	0
Brown, R.	30	13	8	11
Calkins	2	2	3	1
Card	13	5	2	9
Christenat	2	0	0	0
Clare	6	0	2	2
Clark	4	7	2	6
Cook	20	17	4	12
Davis	10	12	26	7
Ellis	11	10	7	3
Enderse	16	12	12	13
Gallagher	9	2	5	1
Gates	12	3	13	15
Grinnell	13	3	12	14
Hardy	14	10	8	12
Healey	11	8	5	7
Hitchcock	10	0	1	0
Hollenbeck	8	1	3	1
Kane, E.	17	2	7	12
Kane, H.	6	12	9	13
Kinney	12	4	12	13
Landpher	13	12	8	15
Lyon	17	13	8	9
McEvoy	3	0	0	0
McGuire	19	0	11	8
McMahon	16	13	8	13
Mullally	3	1	0	0
O'Brien	5	6	7	8
Potter	2	0	0	1
Reardon	13	8	7	8
Stark	6	1	4	1
Sheridan	11	6	8	8
Smith	6	5	3	4
Spaulding	4	0	0	2
Wadsworth	3	0	3	0
Weigand	7	3	6	12
Wells	14	12	8	14
Sum	386	204	223	255
Average	10.16	5.37	6.08	6.92

APPENDIX A (Continued).

Errors in Tests 1-4, Cortland Pupils, Proposed Key.

Pupils.	Test 1.	Test 2.	Test 3.		Test 4.	
			Total Errors.	A, O, U— Errors.	Total Errors.	A, O, U— Errors.
Brown, J.	12	15	9	5	6	5
Cowan	17	5	7	5	10	6
Frink	13	8	10	8	12	5
Gilbertson	18	8	6	5	16	10
Harkness	3	3	6	4	10	5
Holden	10	6	2	2	5	5
Jones	14	6	4	3	11	4
Kennedy	8	5	9	4	9	7
Lanigan	11	8	12	7	10	8
Lewis	12	8	9	7	15	8
Lovell	10	6	7	3	6	3
Lyman	16	6	9	6	13	8
Madden	25	13	9	6	9	2
Maher, T.	15	8	13	8	17	7
Maher, W.	16	10	7	6	6	5
McGraw	25	10	3	3	13	7
McNiff	13	4	8	5	8	4
Munson	10	7	8	4	9	5
Peck	8	8	11	8	11	9
Potter	28	7	11	7	11	7
Reale	18	15	26	3	13	9
Ryan	20	22	11	5	15	9
Scudamore	17	8	11	9	14	4
Spaulding	11	8	10	7	12	6
Temperton	15	4	5	4	10	4
Watrous	27	19	6	2	8	3
Wilson	9	13	11	7	8	4
Weeks	9	6	9	5	10	7
White	22	14	12	6	15	10
Wood	19	17	12	8	--	--
Wright	13	8	7	6	11	7
Sum	464	285	280	168	323	183
Average	14.97	9.20	9.03	5.42	10.77	6.10

APPENDIX B.

Errors in Test 6, Cortland Pupils, Webster Key.*

Symbol	Lyon	Smith	Morris	McMahon	Erway	Bronson	Enderse	Davis	Clare	Gallagher	Reardon	Card	Hollenbeck	Welgand	Ackley	Gates	Mullally	McGuire	Sum.
ē	·							ȧ						ĕ		ī			3
ū				ŭ							ŭ								2
ī		·						ȧ			ĭ	ĭ		ĭ					4
ch																			0
oi																ou			1
o͝o	ô	ä		ou	ä	ă		o͞o	ô		o͞o	ȧ	ŏ	ô		ou	?	o͞o	14
ou							ŭ												1
ô	ȧ	ȧ		ou				o͞o		ä		ŏ		ō		oi		ō	9
ā							ȧ	ä						ȧ		â			4
û			y	ŭ		ŭ	ū	ū			ŭ	ŭ		ū	ŭ	ū			10
ä	ă			ă											ȧ	â			4
ŏ		ä		ĕ	ȧ			o͞o		ŭ	ō			ō	?	ou		o͝o	10
ă					ä		ȧ			ȧ		ä	ä	ä	ȧ			ā	8
ŭ			ū		ū		ū	ū					ū	ū		ū		û	8
ĕ				ē				ŭ						ē		ē			4
th																th			1
o͞o	ou				o͞o			o͞o			o͞o			o͞o		o͞o			6
zh																			0
ē																ē			1
o͝o	ŭ				o͝o		o͝o		o͝o							o͝o			5
ȧ				ă	ē		ă									â			4
ī								ŭ								ī			2
th															th				1
â	ă	ä				ä	ȧ		ä		ä	ā	ä					ȧ	9
Sum	6	3	3	8	7	3	8	11	3	3	7	6	4	11	5	16	1	6	110

APPENDIX B (continued).

Errors in Test 6, Cortland Pupils, Proposed Key.*

*When the pronunciation was wrong, the sound given is indicated opposite the symbol and the pupil's name and in the Webster Key. A question mark (?) indicates that no pronunciation was attempted.

Symbol	Weeks	Lyman	Lovell	Kennedy	McGraw	Maher, T.	Lanigan	Holden	Scudamore	Maher, W	Lewis	Ryan	Ellison	Peck	McNiff	Temperton	Allen	Harkness	Sum.
e	ē				ē	?	ĭ		ē		ē		ē			ĭ		ē	9
ū	ū	ū			ŭ	ou				û			ū	ū			ŭ	ū	9
ɑi			ä			ā	oi				oi		oi	oi		oi			7
ch																			0
ei				ou															1
o	ŏ	ŭ		ô			ō	ō							ou		û		7
au	ī								o͞o			ä:	o͞o			o͞o	ŏ	?	7
ɵ		ȧ	ȧ	o͞o	ou	o͞o			o͞o	ō	o͞o	?		ŭ	ō		oi	ð	13
ī		ī	ī	ī	ī	ĭ	ĭ		ī		ī	ī	ĭ	ī	ī		ī	ī	14
ā			ä	ȧ	ā	ȧ	ȧ	ă	ȧ	ā	ā	ā	ä	ā		ä:	ä	ȧ	15
iu	ī	o͞o	?	ū	ī		o͞o		oi			o͞o	?			o͞o	o͞o		11
ɑ	ă		ă		ă	ā	ā	ă	ā	ă				ā	ă	ă	ā		12
ɵ		ŭ	ȧ	ō	ou	oi	ō		ō	oi	ū	ō	ō	ŭ	ō	ŭ	o͞o	?	16
a		ȧ		ā		ä				ā	ŭ	ä:	ä	ā	ä	ä:			10
ū	o͞o	o͞o		o͞o	o͞o	ū	o͞o		o͞o	ū	ū	ū	ū	ū	ū	o͞o	o͞o	ū	16
th							th												1
u	o͞o		o͞o		o͞o	ŭ	o͞o	o͞o	ū	o͞o	ū	o͞o		ū	ū	ou	ū	?	15
ʒ			z	z	z				z	z		z			z				7
ē	ē	?	ĕ	ĕ	ē	ē	ĭ		ē	ĕ	ē	ĕ	ĭ	ē	ĕ		ĕ	ē	16
ū	ŭ	ŭ	ŭ	ŭ	o͞o	o͞o	o͞o	o͞o	ŭ	ū	o͞o	o͞o	ĭ	ū	ū	o͞o	o͞o	o͞o	18
ā							ā			ĕ		ĕ		ā			ă		5
i			ė	ē	ī					ī	ī	ī	ī	ī			ī	ī	10
th					th	th	th				th	th							5
Sum	10	10	12	13	15	14	15	5	13	13	13	15	13	14	11	11	15	12	224

APPENDIX C.

Comparative Ease of Learning the Two Keys. Cornell and Missouri Students.

Session.		Webster Key.						Proposed Key.					
		First.		Second.				First.		Second.			
Order.		Regular.		Regular.		Chance.		Regular.		Regular.		Chance.	
Obs.	Grp.	Rep.	Er.	Rep.	Er.	Rep.	Er.	Rep.	Er.	Rep.	Er.	Rep.	Er.
May.	I	14	28	1	0	8	16	10	30	2	1	7	23
Di.	II	6	3	2	1	1	0	8	11	1	0	2	2
Do.	I	7	3	1	0	1	0	9	5	1	0	1	0
Je.	II	8	5	1	0	1	0	14	41	2	1	3	3
Yo.	I	9	16	1	0	6	17	6	14	3	5	13	38
Da.	II	7	13	2	1	4	20	11	41	4	8	14	37
Ne.	I	12	22	2	1	1	0	14	32	2	2	1	0
Wa.	II	6	2	1	0	1	0	7	9	2	1	2	1
Mat.	I	10	29	1	0	1	0	7	7	1	0	11	17
Bo.	II	3	0	1	0	1	0	5	2	1	0	4	10
Sa.	I	6	10	1	0	1	0	5	4	4	5	2	1
Bl.	II	3	0	1	0	1	0	8	8	1	0	4	6
Total		91	131	15	3	27	53	104	204	24	23	64	138
Mc.	I	9	20	2	1	1	0	3	0	2	2	1	0
Wa.	II	3	0	1	0	1	0	7	12	2	2	7	10
Mc.	I	10	18	3	2	2	1	5	5	2	2	4	6
Bas.	II	3	0	2	1	2	1	18	48	2	1	4	7
Bar.	I	11	41	3	4	3	2	4	2	2	1	2	2
Mu.	II	3	0	1	0	2	1	10	40	1	0	7	12
Total		39	79	12	8	11	5	47	107	11	8	25	37

APPENDIX D.

Comparative Speed and Accuracy in Use of Keys in Pronouncing Proper Names.

Test-List.		Webster Key.								Proposed Key.							
		List A.		List B.		List C.		List D.		List A.		List B.		List C.		List D.	
Obs.	Grp.	Time.	Er.	Time.	Er.	Time.	Er.	Time.	Er.	Time.	Er.	Time.	Er.	Time.	Er.	Time.	Er.
May	I	206.7	14	113.1	9									56.2	13	62.7	17
Di.	II					76.4	7	74.4	6	135.1	9	78.7	5				
Do.	I	75.5	5	83.1	1									56.7	5	51.6	7
Wa.	II					88.0	7	69.5	3	68.7	5	67.0	10				
Yo.	I	141.3	16	130.7	15									83.0	13	73.0	15
Da.	II					221.0	23	161.0	24	190.0	23	363.0	31				
Mat.	I	62.0	16	47.3	26									69.4	11	73.5	15
Bo.	II					56.2	9	90.1	10	100.0	5	81.5	9				
Sa.	I	49.1	19	41.2	7									52.0	12	66.0	11
Bl.	II					54.5	5	53.3	0	59.0	6	63.0	4				
Sum		534.6	70	415.4	58	496.1	51	448.3	43	552.8	48	653.2	59	317.3	54	326.8	65
Mo.	I	106.0	15	91.4	9									91.6	16	80.0	14
Wa.	II					68.4	14	68.0	8	174.6	8	125.0	12				
Mc.	I	177.0	11	206.8	8	----	--	----	--	----				232.4	17	204.4	13
Bas.	II					94.2	6	108.8	8	159.4	11	128.2	9				
Bar.	I	221.2	22	164.2	19									178.0	14	138.0	10
Mu.	II					103.4	9	110.4	11	154.4	8	146.2	15				
Sum		504.2	48	462.4	31	266.0	29	279.2	27	488.4	27	399.4	37	491.0	47	422.4	37

APPENDIX E.

Comparative Speed and Accuracy in Use of Keys in Pronouncing Nonsense Syllables.

Obs.	Grp.	Webster Key.								Proposed Key.							
		List I.		List J.		List K.		List L.		List I.		List J.		List K.		List L.	
		Time.	Er.	Time.	Er.	Time.	Er.	Time.	Er.	Time.	Er.	Time.	Er.	Time.	Er.	Time.	Er.
May.	I	36.2	5	32.2	9									21.2	4	22.0	11
Di.	II					13.1	1	20.5	1	21.4	3	28.2	3				
Do.	I	21.6	0	25.8	1									21.8	1	22.3	1
Je.	II					44.1	3	38.1	5	108.2	6	102.5	5				
Yo.	I	37.5	6	35.5	10									19.5	13	17.8	7
Da.	II					119.8	7	62.8	8	62.0	15	101.0	11				
Sa.	I	17.8	3	12.5	3									21.0	4	20.6	7
Bl.	II					25.0	2	20.9	0	17.5	1	15.3	5				
Mat.	I	20.1	3	19.9	4									18.9	5	19.5	6
Bo.	II					32.1	7	27.6	4	28.2	8	29.5	9				
Sum		133.2	17	126.9	27	234.1	20	169.9	18	237.3	33	276.5	33	102.4	27	102.2	32
Mo.	I	24.6	4	25.2	6									33.0	2	38.8	4
Wa.	II					24.6	1	24.2	2	30.6	6	35.6	5				
Mc.	I	65.4	3	84.6	5									78.8	4	74.8	6
Bas.	II					29.5	0	27.6	1	65.6	2	68.0	9				
Bar.	I	67.4	7	71.2	10									50.8	3	51.0	6
Bu.	II					26.8	3	29.4	3	53.4	4	43.8	5				
Sum		157.4	14	180.0	21	80.9	4	81.2	6	149.6	12	147.4	19	162.6	9	164.6	16

APPENDIX F.

Comparative Speed and Accuracy in Use of Keys in Phonetic Transcription.

Obs.	Grp.	Webster Key.						Proposed Key.					
		List M.			List N.			List M.			List N.		
		Time.	Errors.		Time.	Errors.		Time.	Errors.		Time.	Errors.	
			Key.	Com.		Key.	Com.		Key.	Com.		Key.	Com.
May.	I	515	21	3							420	29	9
Di.	II				423	15	6	420	11	3			
Do.	I	316	6	7							360	10	6
Je.					900	18	4	960	24	1			
Ne.	I	550	18	11							540	20	5
Wa.	II				410	10	25	450	13	20			
Mat.	I	330	31	19							470	44	25
Bo.	II				325	18	11	570	28	6			
Sa.	I	420	19	13							540	30	11
Bl.	II				400	8	6	400	13	8			
Sum		2131	95	53	2458	69	52	2800	89	38	2330	133	56
Mo.	I	--	12	3								20	7
Wa.	II					10	11	--	26	5			
Me.	I	--	19	14								22	12
Bas.	II					10	10	--	22	8			
Bar.	I	--	34	9								29	16
Mu.	II					14	10	--	15	6			
Sum		--	65	26	--	34	31	--	63	19		71	35

APPENDIX G.

Preferred Alternative Pronunciation.

Symbol.	Test-words.	38 School Children.				34 College Students.			
		Webster.	N. E. A	Other.	Blank.	Webster.	N. E. A	Other.	Blank.
ā	hā	29	1	7	1	32	1	0	1
	kāv	27	0	5	6	29	0	5	0
	kām	26	1	6	5	32	2	0	0
	āmz	6	0	19	13	25	6	2	1
	pā	18	7	6	7	33	1	0	0
	sām	26	0	6	6	33	1	0	0
	Total	132	9	49	38	184	11	7	2
	Average	22.00	1.50	8.17	6.33	30.66	1.83	1.17	0.33
ī	stīl	15	2	21	0	23	9	2	0
	nī	17	0	16	5	24	7	3	0
	slīt	26	1	9	2	27	7	0	0
	sīt	28	0	8	2	27	6	0	1
	pīl	21	1	11	5	26	7	1	0
	nīt	21	0	11	6	28	6	0	0
	Total	128	4	76	20	155	42	6	1
	Average	21.33	0.66	12.66	3.33	25.83	7.00	1.00	0.17
ē	hwēl	23	0	12	3	25	2	5	2
	nē	35	0	2	1	25	9	0	0
	hēt	26	1	9	2	29	3	2	0
	sē	37	0	0	1	31	3	0	0
	Total	121	1	23	7	110	17	7	2
	Average	30.25	0.25	5.75	1.75	27.50	4.25	1.75	0.50
ū	sūt	26	2	5	5	23	11	0	0
	pūr	19	6	3	10	13	18	3	0
	fūd	3	22	4	9	8	25	1	0
	Total	48	30	12	24	44	54	4	0
	Average	16.00	10.00	4.00	8.00	14.66	18.00	1.33	0

APPENDIX H.

Interpretation of the Proposed Symbols *ai*, u, *au* and the Webster Symbol ou.

Symbol.	Test-word.	38 School Children.			34 College Students.		
		Like Key.	Blank.	Unlike Key.	Like. Key.	Blank.	Unlike Key.
ai	pail	0	3	35	5	0	29
	hwail	0	9	29	5	1	28
	vain	1	6	31	5	0	29
	vail	1	6	31	5	0	29
	mai	4	8	26	8	1	25
	pain	1	6	31	5	0	29
	nail	2	6	30	4	1	29
	stail	0	8	30	4	1	29
	Total	9	52	243	41	4	227
	Average	1.12	6.50	30.37	5.12	0.50	28.40
u	tuk	2	3	33	28	0	6
	buk	3	4	31	30	0	4
	luk	2	10	26	28	0	6
	Total	7	17	90	86	0	16
	Average	2.33	5.66	30.00	28.66	0	5.33
au	aut	10	2	26	20	0	14
	hau	2	2	34	19	0	15
	laud	16	10	12	22	1	11
	Average	28	14	72	61	1	40
	Total	9.33	4.66	24.00	20.33	0.33	13.33
ou	nou	20	3	15	17	0	17
	sou	12	7	19	16	1	17
	houl	17	4	17	29	1	4
	Total	49	14	51	62	2	38
	Average	16.33	4.66	17.00	20.66	0.66	12.66

APPENDIX I.

Directions for Conducting Experiments with Phonetic Keys.

(N. B.—Before beginning the experiments, read these directions over twice. Write to Professor Whipple at once if any point is obscure. Do not vary the conduct of the experiments in any detail unless it is positively unavoidable, and then make a record of the variation.)

Object.—The object of these experiments is to assist in determining which of two phonetic alphabets (here referred to as Key No. 1 and Key No. 2) is the more desirable, psychologically and pedagogically, for use in the public schools. Other supplementary experiments are being made with adults at Cornell University and with beginners in reading in the Ithaca public schools.

Persons to Be Tested.—The present experiment is to be tried with public-school children who have mastered the mechanics of reading, but who have not yet learned to read any foreign language. These pupils may be in any grade from the fourth to the eighth and of either sex. If in any way possible, they should be children that have not been taught anything about phonetic symbols (that would not know, for example, what difference in sound is indicated by ĕ and by ē).

Method.—(1) The pupils selected must be divided into two groups, each group to contain approximately the same number, say 15 to 50. The two groups should be so composed as to represent as nearly as possible the same range and distribution of mental ability, so that, in the opinion of their teachers, the one group would, on the average, be as likely to do well with the experiment as the other. One group is to work with Key No. 1 only, the other with Key No. 2 only, and the same teacher must conduct the experiment with each group.

(2) The experiment comprises five exercises in learning and five tests which are used to measure the speed and permanency of the learning. The first two tests are inserted during the period of learning (which occupies one week): the remaining three follow at subsequent dates. It is not expected that all, or perhaps that any, of the pupils will become "letter-perfect" during the period of learning, but this does not alter the value of the tests.

(3) The experiment must be started on a Monday and be continued, so far as the learning period is concerned, daily for one week, that is, from Monday to Friday of a single week. During this period the lessons must be given at the same period (for either group) daily. One group

may work at one period, the other at another, provided the two periods be not placed at hours that are obviously unequal for mental work. It would not do, for instance, to work with one group at nine in the morning and with the other at three in the afternoon.

(4) *The learning.* All exercises in learning are to be conducted with the aid of the printed Keys, one of which is to be supplied to each pupil *for use during the exercises only.* (For this reason the printed Key is to be distributed to the pupils printed side down, with instructions not to turn it over until the command is given. Likewise, when the exercise is finished for the day, all pupils must turn the Key printed side down on the desk, when it is to be collected and returned to the teacher until the next exercise. The Key is distributed, then, daily, and collected daily.)

(4a) *The first lesson.* This exercise differs from the remainder in that the teacher prefaces it by a short explanation, and in that she takes occasion to call explicit attention to the printed phonetic symbols.

The preliminary explanation of the teacher is as follows: "You know that many words in our language are not pronounced as they are spelled and that the same letter often has different sounds, so that we cannot always tell, when we see a new word, just how it should be pronounced. In dictionaries the right way to pronounce a word is explained by using a special kind of alphabet called a phonetic alphabet. This means that the words are spelled again in this special kind of alphabet to show how they are sounded. This special alphabet uses most of the regular letters of the alphabet and some new ones, but whatever letters are used they always have exactly the same sound; each letter has one sound and no other. For example, when we spell cat we used the letter C to stand for a K sound, but when the pronunciation of cat is shown in the dictionary the letter K is used, because that letter always stands for the K sound, so the pronunciation-word for cat is spelled K-A-T. Now, the vowels, a, e, i, o, u, have different sounds, as you know, like '*ay*' and '*ah*,' '*ee*' and '*eh*,' and so forth. In explaining pronunciation each one of these different sounds has to be shown by a special kind of letter, so that we can always tell when we see the letter just which *a*-sound or which *e*-sound is meant. We shall try to learn one of these pronouncing alphabets this week by reading it over together aloud once each morning. Each time we read it over you must look carefully at the letters that show the different sounds, so that you will surely remember what sound each letter stands for."

Explain that the papers are not to be looked at or read except when the command is given. Distribute the Key to be used in the Group. Read it over slowly the first time, calling attention directly to the letter-symbol and to the key-word, having the class make the sound of the symbol. For example, in Key No. 1, begin thus: "A as in ale, or as the vowel sound in *prey.* Look at the letter: notice that it is a small letter *a* with a straight line above it. It means the sound '*a*' pronouncing the *a* in *ale*). Take

the next letter. This is another sound of *a*, *A* as in *care*. You notice this *a* has a different mark over it. It means the sound '*a*' (pronouncing the *a* in *care*)." Work through the entire key in this manner in the first lesson, calling attention directly to the form of the printed symbol, to the key-word, and to the sound itself, which should be pronounced once by the pupils in concert. Note also the special marks in one or the other of the keys for *ch*, *sh*, *th*.

(4b) *The remaining four lessons.* Keys are distributed and collected as in the first lesson. The teacher makes no mention at all of the form of the symbol. The teacher does nothing but read over the key, line by line, the pupils pronouncing out loud, in concert, after the teacher reads each line. Both in the teacher's reading and in the pupils' repetition the ordinary name of the letter is not spoken; only its sound is spoken. The teacher and class say, for example, "*ah*" as in "*arm*," using the sound of *a* that is found in *arm*, not the name of the letter *A*. The same holds of all the sounds in the key, both in consonants and vowels. Thus *F* is not named as "*ef*," but sounded like the first sound in *fill*. The reading of the key straight through once in this way constitutes the lesson. The keys are collected at once and no further reference made to the exercise.

(5) *The tests.* Tests 1 and 2. On the Wednesday and Friday of the week of learning exercises, directly after the conclusion, therefore, of the 3d and 5th "learning lesson," give the pupils blank paper, direct them to record their names, school, and date. Then exhibit, one at a time, in the order of their numbers, the series of enlarged phonetic symbols (series I-1 to I-44 or series II-1 to II-44, according to whether Key 1 or Key 2 is on trial). Direct the pupils to number their answers 1 to 44 and to write after these numbers the key-words that were learned to illustrate the symbol. For example, in Key 2, when AU (the 4th character) is shown, the pupils would, if they had learned the key, write the word "*out*."

Test 3. On the Monday following the week of lessons, without another reading of them, supply the pupils with blank paper, record names, etc., as above, then read, one at a time, the key-words, *e. g.*, on Key 1, ale, care, am, etc., or on Key 2, arm, ask, aisle, etc., asking the pupils in each case to write the symbol for the sound the key-word illustrates. Example, with Key 1, the command would be: "Write the symbol (or phonetic letter) for the *a* in 'ale.' Write the symbol for the *a* in 'care,'" and so on, straight through the Key. Allow reasonable time for this work and prohibit copying.

Test 4. On the following Monday, that is, one week after Test 3, repeat Test 3, but arrange the series in chance order. Keep the collected papers in another pile and label them Test 4.

Test 5. On the following Tuesday, that is, one day after Test 4, distribute the forms marked List M, having first crossed out either the figure 2 or the figure 1 in the directions, according to whether the group used Key 1 or Key 2. Allow exactly 20 minutes, no more, no less, from the

time the papers are turned over to begin the work. Give no help or other instructions unless positively necessary, and then make a note of what instructions were given.

RETURNING DATA.—Attach an explanatory slip of paper on each pile of papers, so that it will be clear from what city it came, from what school, what teacher, which test it represents, and whether the writers had been taught Key No. 1 or Key No. 2.

Forward by American or United States Express, collect, to Prof. Guy M. Whipple, 248 Goldwin Smith Hall, Ithaca, N. Y.

Professor Whipple will also welcome from the teachers who conducted the experiments comments or opinions, whether in general or in detail, as to the relative merits and feasibility of the two keys.

APPENDIX J.

KEY No. 1

ā	as	in	ale, prey	ō	as	in	old
â	"	"	care	ȯ	"	"	obey, poetic
ă	"	"	am	ô	"	"	orb
ä	"	"	arm	ŏ	"	"	odd, not
å	"	"	ask, artistic	oi	"	"	oil
b	"	"	be	o͞o	"	"	food, rule
ch	"	"	chair	o͝o	"	"	foot, pull
d	"	"	day	ou	"	"	out
ē	"	"	eve, marine	p	"	"	pen
ĕ	"	"	end	r	"	"	rap
ẽ	"	"	maker	s	"	"	so
f	"	"	fill	sh	"	"	she
g	"	"	go	t	"	"	time
h	"	"	hat	th	"	"	thin
ī	"	"	ice, aisle	t͟h	"	"	then
ĭ	"	"	ill	ū	"	"	use
j	"	"	joke	û	"	"	urn
k	"	"	keep	ŭ	"	"	up
l	"	"	late	v	"	"	vat
m	"	"	man	w	"	"	want
n	"	"	no	y	"	"	yard
ng	"	"	sing	z	"	"	zone
ŋ	"	"	bank	zh	"	"	azure

APPENDIX J (Continued).

KEY No. 2

ā	as	in	arm	ŋ	as	in	bank, sing
ɑ	"	"	ask, artistic	ō	"	"	old
ɑi	"	"	ice, aisle	o	"	"	obey, poetic
ɑu	"	"	out	ō	"	"	orb
ā	"	"	care	ɵ	"	"	odd, not
a	"	"	am	ɵi	"	"	oil
b	"	"	be	p	"	"	pen
ch	"	"	chair	r	"	"	rap
d	"	"	day	s	"	"	so
ē	"	"	ale, prey	sh	"	"	she
e	"	"	end	t	"	"	time
f	"	"	fill	th	"	"	thin
g	"	"	go	th	"	"	then
h	"	"	hat	ū	"	"	food, rule
ī	"	"	eve, marine	u	"	"	foot, pull
i	"	"	ill	ū	"	"	urn
iu	"	"	use	u	"	"	up, maker (?)
j	"	"	joke	v	"	"	vat
k	"	"	keep	w	"	"	want
l	"	"	late	y	"	"	yard
m	"	"	man	z	"	"	zone
n	"	"	no	ʒ	"	"	azure

APPENDIX K.

LIST A

Trobriand	trō′brē-änd′	trō′brī-ānd′
Deucalion	do͞o-kā′lĭ-ŭn̨	du-kē′li-un
Abbassids	ăb-băs′ĭdz	ab-bas′idz
Cunobelin	kū-nō′bē-lĭn	kiu-nō′bī-lin
Barèges	bä′rāzh′	bā′rēʒ′
Krementchug	krā′men-cho͞og′	krē′men-chūg′
Blasius	blā′sĭ-ŭs	blē′si-us
Zeirides	zī′rĭ-dēz	zai′ri-dīz
Frithiof	frĭt′yŏf	frit′yef
Dunfermline	dŭn-fĕr′lĭn	dun-fer′lin
Lazzarini	lä′tsä-rē′nē	lā′tsā-rī′nī
Campeggio	kăm-pād′jō	kām-pēd′jō
Pisuerga	pē-swĕr′gä	pī-swer′gā
Montanus	mŏn-tā′nŭs	men-tē′nus
Buitenzorg	boi′tĕn-zôrg	boi′ten-zorg
Nedounkadou	nē-doun′kȧ-dou	ne-daun′ka-dau
Kootenai	kō͞o′tē-nā	kū′tī-nē
Chinandega	chē′nän-dā′gȧ	ċhī′nan-dē′ga
Wursteisen	vo͞or′stĭ-sĕn	vur′stai-sen
Callacaud	kăl′ȧ-kôd′	kal′a-kēd′
Dellenbaugh	dĕl′ĕn-bô	del′en-bē
Bustamente	bo͞os′tä-mĕn′tā	bus′tā-men′tē
Abiathar	ȧ-bī′ȧ-thȧr	a-bai′a-ṫhar
Petruchio	pē-tro͞o′chĭ-ō	pī-trū′ċhi-ō
Nanaimo	nȧ-nī′mō	na-nai′mō

APPENDIX K (Continued).

LIST B

Zwellendam	zwĕl′lĕn-däm′	zwel′len-dām′
Conybeare	kŭn′ĭ-bâr	kun′i-bār
Ostrogoisk	ŏs′trŏ-goisk′	os′tro-goisk′
Cagliostro	kä-lyōs′trō	kā-lyōs′trō
Burhanpur	bo͝or′hän-po͝or′	bur′hān-pur′
Daphius	dā′fĭ-ŭs	dē′fi-us
Grundtvig	grō͞ont′vēg	grūnt′vīg
Faizabad	fī′zä-bäd′	fai′zā-bād′
Bubastis	bū-băs′tĭs	biu-bas′tis
Csaikisṭen	chĭ-kĭs′tĕn′	chai-kis′ten′
Dauphiné	dō′fē′nā′	dō′fī′nē′
Iberia	ī-bē′rĭ-ȧ	ai-bī′ri-a
Oronokoo	ō′rō-nō′kō͞o	ō′ro-nō′kū
Carpeaux	kär′pō′	kār′pō′
Leosthenes	lē-ŏs′thē-nēz	lī-os′thī-nīz
Donalbain	dŏn′ȧl-bān	don′al-bēn
Magliabecchi	mä′lyä-bĕk′kē	mā′lyā-bek′kī
Nélaton	nā′lä′tôŋ′	nē′lā′tōŋ′
Pihahiroth	pĭ′hä-hĭ′rŏth	pai′hā-hai′roth
Rabsaris	răb-sā′rĭs	rab-sē′ris
Vaitupu	vī-tō͞o′pō͞o	vai-tū′pū
Zigliara	tsē-lyä′rä	tsī-lyā′rā
Mambrino	mäm-brē′nō	mām-brī′nō
Ottakring	ŏt′tä-krĭng	ot′tä-kriŋ
Looshtook	lō͞osh′tō͞ok′	lūsh′tūk′

APPENDIX K (Continued).

LIST C

Zurlo	dzo͝or′lō	dzūr′lō
Nimeguen	nĭm′ā-gĕn	nim′ē-gen
Bajazet	bä′jä-zĕt′	bā′jā-zĕt′
Carlovitz	kär′lō-vĭts	kār′lo-vits
Inchiquin	ĭnch′ĭ-kwĭn	inch′i-kwin
Hufeland	hō͞o′fē-länt	hū′fe-lānt
Blefusca	blē-fŭs′kȧ	blĭ-fus′ka
Custance	kŭs′tȧns	kus′tans
Aquitaine	ăk′wē-tān′	ak′wĭ-tēn′
Dhubboree	dŭb′ō-rē′	dub′o-rĭ′
Leucippus	lō͞o-sĭp′ŭs	lu-sip′us
Berezovsk	bĕr′ā-zŏvsk′	ber′ē-zovsk′
Dupuytren	dọ͞o′poo-ē′trăn′	du′pu-ĭ′trāŋ
Hrungnir	hrŭng′nēr	hrun′nur
Caerphilly	kȧr-fĭl′lē	kar-fil′lĭ
Aguarico	ä′gwä-rē′kō	ā′gwā-rĭ′kō
Sniadecki	snē′ä-dĕts′kē	snĭ′ā-dets′kĭ
Cleckheaton	klĕk′ē-tŭn	klek′ĭ-tun
Pergolese	pĕr′gō-lā′sā	per′gō-lē′sē
Cirillo	chē-rēl′lō	ch‍ĭ-rĭl′lō
Ajodhya	ȧ-yōd′hyȧ	a-yōd′hya
Bunzlau	bo͞onts′lou	bunts′lau
Moscheles	mŏsh′ē-lēs	mesh′e-les
Cazembe	kȧ-zĕm′bē	ka-zem′be
Bugenhagen	bō͞o′gĕn-hä′gĕn	bū′gen-hā′gen

APPENDIX K (Continued).

LIST D

Cadwalader	kăd-wŏl′ă-dēr	kad-wel′ɑ-dur
Busirane	bo͞o′sĭ-răn	bū′si-rēn
Lædedæmon	lăs′ē-dē′mŏn	las′ī-dī′mɐn
Holofernes	hŏl′ō-fûr′nēz	hel′o-fūr′nīz
Brongniart	brôŋ′nyē-är′	brēŋ′nyī-ūr′
Ctesias	tē′shĭ-ăs	tī′shi-ɑs
Learchus	lē-är′kŭs	lī-ūr′kus
Batthyanyi	bŏt-yän′yē	bɐt-yūn′yī
Dombrovski	dŏm-brŏv′skē	dɐm-brɐv′skī
Navasota	năv′ă-sō′tă	nav′ɑ-sō′tɑ
Xanadu	zăn′ă-do͞o	zan′ū-dū
Yeardley	yērd′lĭ	yīrd′li
Morioka	mō′rē-ō′kă	mō′rī-ō′kū
Bindraban	bĭnd′ră-băn′	bind′rɑ-bān′
Hérault	ā′rō′	ē′rō′
Corydon	kŏr′ĭ-dŭn	kɐr′i-dun
Orleans	ôr′lē-ănz	ēr′lī-ɑnz
Slaviansk	slăv-yänsk′	slāv-yūnsk′
Cooninxloo	kō′nĭnks-lō	kō′ninks-lō
Aravalli	ă′ră-văl′lē	ū′rɑ-vūl′lī
Bromsgrove	brŏmz′grōv	brɐmz′grōv
Dunsinane	dŭn′sĭ-năn′	dun′si-nēn′
Lenôtre	lē-nō′tr’	le-nō′tr
Berditchef	bĕr′dē-chĕf′	ber′dī-ʧef′
Genovesi	jā′nō-vā′zē	jē′nō-vē′zī

APPENDIX L.

LIST I

1	tay	tā	tē
2	zen	zĕn	zen
3	veme	vēm	vīm
4	eit	ĭt	ait
5	nis	nĭs	nis
6	zud	zŭd	zʊd
7	dro	drō	drō
8	wol	wŏl	wɒl
9	zige	zĭj	zaij
10	luh	lŭ	lʊ
11	ild	ĭld	ıld
12	rud	rŭd	rʊd
13	tud	tŭd	tʊd
14	urf	ûrf	ōrf
15	gabe	gāb	gēb
16	pum	pŭm	pʊm
17	gah	gä	gā
18	arb	ärb	ārb
19	zane	zān	zēn
20	jik	jık	jik
21	bli	blĭ	blɑi
22	bri	brĭ	brɑi
23	rabe	rāb	rēb
24	ift	ıft	ift
25	aum	ôm	ōm

APPENDIX L (Continued).

LIST J.

1	yef	yĕf	yef
2	rin	rĭn	rin
3	orp	ôrp	ōrp
4	pud	pŭd	pʊd
5	gom	gŏm	gɐm
6	vol	vŏl	vɐl
7	euk	ūk	iuk
8	sefe	sēf	sĭf
9	ank	ăŋk	aŋk
10	jur	jûr	jūr
11	rike	rīk	raik
12	nuc	nŭk	nʊk
13	tef	tĕf	tef
14	lom	lŏm	lɐm
15	fide	fīd	faid
16	vid	vĭd	vid
17	zete	zēt	zĭt
18	dak	dăk	dak
19	ung	ŭng	ʊng
20	geg	gĕg	zeg
21	tau	tô	tō
22	ahn	ăn	ān
23	uff	ŭf	ʊf
24	teg	tĕg	teg
25	ruje	rōōj	rūj

APPENDIX L (Continued).

LIST K

1	elt	ĕlt	elt
2	ilt	ĭlt	ilt
3	smi	smĭ	smai
4	nene	nēn	nīn
5	gla	glā	glē
6	lud	lŭd	lud
7	rad	răd	rad
8	lel	lĕl	lel
9	cha	chā	ċhē
10	hebe	hēb	hīb
11	arl	ärl	ārl
12	oneb	ŏ′nĕb	ŏ′neb
13	irm	ûrm	ūrm
14	ruve	rōōv	rūv
15	erf	ûrf	ūrf
16	gur	gûr	gūr
17	ite	ĭt	ait
18	pru	prōō	prū
19	baw	bô	bē
20	ret	rĕt	ret
21	ime	ĭm	aim
22	ull	ŭl	ul
23	zine	zīn	zain
24	acq	ăk	ak
25	jek	jĕk	jek

APPENDIX L (Continued).

LIST L

1	ige	ĭj	aij
2	buh	bŭ	bu
3	spo	spŏ	spō
4	ipp	ĭp	ip
5	ume	ŭm	ium
6	arg	ärg	ārg
7	ept	ĕpt	ept
8	ibe	ĭb	aib
9	ong	ŏng	eng
10	orm	ôrm	ērm
11	eig	āg	ēg
12	lin	lĭn	lin
13	lech	lĕch	lech
14	pof	pŏf	pef
15	quo	kwŏ	kwō
16	tob	tŏb	teb
17	urs	ûrs	ūrs
18	kune	kūn	kiun
19	zibe	zĭb	zaib
20	gos	gŏs	ges
21	orl	ôrl	ērl
22	ith	ĭth	ith
23	tase	tās	tēs
24	upe	ūp	iup
25	ing	ĭng	ing

APPENDIX M.

List M.

Name_____School_____Date_____

Write in Key No. 1 2 the phonetic equivalent of the following words. Work as rapidly as you can, but try to make no mistakes.

foot	furl
bank	bear
fat	bunk
ever	choose
ill	ship
food	not
or	hat
aha	mute
azure	net
up	moon
aisle	seizure
obey	push
ale	ask
then	pine
chew	poetic
long	though
care	lip
use	art
out	sup
end	orb
ah	through
thin	bout
urn.	see
odd	sing
vision	bay

APPENDIX M (continued).

List N.

Name_____School_____Date_____

Write in Key No. 1 2 the phonetic equivalent of the following words. Work as rapidly as you can, but try to make no mistakes.

suit	while
never	match
calm	hot
spank	single
how	house
pun	cur
rule	thine
nail	song
grass	dare
her	pick
pleasure	pool
tooth	propose
hook	path
sure	mean
thou	cube
soft	cook
chide	several
high	pan
flee	lord
saw	part
rare	wealth
pin	me
sent	tub
map	shine
tongue	pain

BOOKS AND MONOGRAPHS

Descriptive circulars of the following publications will be sent upon request:

Relative Efficiency of Phonetic Alphabets: An Experimental Investigation of the Comparative Merits of the Webster Key Alphabet and the Proposed Key Alphabet Submitted to the National Education Association. By GUY M. WHIPPLE, PH.D.

8*vo*, 60 *pages. Introductory price,* 50*c. cloth;* 35*c. paper binding.*

Manual of Mental and Physical Tests: A Book of Directions compiled with Special Reference to the Experimental Study of School Children in the Laboratory or Classroom. By GUY MONTROSE WHIPPLE, PH.D.

8*vo*, 556 *pages, illus.* $2.50; *postage* 18*c.*

The Outlines of Educational Psychology: An Introduction to the Science of Education. By WILLIAM HENRY PYLE, PH.D.

12*mo, viii,* 256. $1.25.

Moto-Sensory Development: Observations on the First Three Years of a Child. By GEORGE V. N. DEARBORN, M.D.

12*mo,* 215 + *vi pages, frontispiece.* $1.50.

Psychology and Pedagogy of Writing: A Résumé of the Researches and Experiments Bearing on the History and Pedagogy of Writing. By MARY E. THOMPSON, A.M., PD.B.

12*mo, cloth, illus.,* 128 *pages.* $1.25.

Spelling Efficiency in Relation to Age, Grade and Sex, and the Question of Transfer: An Experimental and Critical Study of the Function of Method in the Teaching of Spelling. By J. E. WALLACE WALLIN, PH.D.

12*mo,* 91 *pages.* $1.25.

When Should a Child Begin School? An Inquiry Into the Relation Between the Age of Entry and School Progress. By W. H. WINCH, M.A.

12*mo, cloth,* 98 *pages.* $1.25.

Backward and Feeble-Minded Children: A Series of Studies in Clinical Psychology. By EDMUND B. HUEY, PH.D.

12*mo,* 190 *pages, illus.* $1.25.

Mental Fatigue: "Die Geistige Ermüdung." By DR. MAX OFFNER. Translated from the German by DR. GUY MONTROSE WHIPPLE.

12*mo, cloth,* 112 *pages.* $1.25.

WARWICK & YORK, Inc.

BALTIMORE, MD., U. S. A.

UNIVERSITY OF CALIFORNIA LIBRARY

THIS BOOK IS DUE ON THE LAST DATE
STAMPED BELOW

JUL 27 1914

AUG 25 1919

MAY 5 1923

30m-1,'15

247068